

Supplemental Table S1

Optimum temperatures for the photosynthetic rate at 360 $\mu\text{L L}^{-1}$ CO_2 concentration (Opt (A_{360})), the RuBP carboxylation rate (Opt (A_c)) and the RuBP regeneration rate (Opt (A_r)), the ratio of the chloroplast electron transport rate to the maximum RuBP carboxylation rate at 25° C (J_{max}/V_{cmax}) and intercellular CO_2 concentration at 25° C (C_i). Statistical analysis of the effect of growth temperature was carried out for each individual species. The data were analyzed by Student's t -test. + $P < 0.1$, * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

	Opt (A_{360})		Opt (A_c)		Opt (A_r)		J_{max}/V_{cmax}		C_i (25°C)	
Cold sensitive species										
<i>Cucumis sativus</i>	15°C-plant	30°C-plant	15°C-plant	30°C-plant	15°C-plant	30°C-plant	15°C-plant	30°C-plant	15°C-plant	30°C-plant
	30.5±1.3	33.6±0.7 *	29.7±0.5	35.9±0.4 ***	30.2±0.9	34.2±0.6 **	1.37±0.07	1.50±0.07 +	274.8±8.8	273.0±12.5
<i>Nicotiana tabacum</i>	27.3±1.1	29.3±1.8 +	27.4±1.0	31.4±0.8 +	27.9±1.1	31.8±1.3 +	1.40±0.07	1.30±0.06	258.5±7.8	282.3±12.4 +
<i>Oryza sativa</i>	29.9±0.8	32.5±1.5 +	30.4±1.1	33.0±1.8 +	30.1±1.0	32.8±1.7 +	1.20±0.06	1.14±0.07	316.0±13.2	322.0±2.7
<i>Solanum lycopersicum</i>	25.3±1.0	29.3±1.0 *	23.1±1.4	28.4±1.3 *	26.5±1.2	32.1±1.2 **	1.96±0.06	1.64±0.09 **	259.5±10.8	301.8±1.8 **
Cold tolerant species										
<i>Secale cereale</i>	21.1±1.7	28.8±1.7 ***	23.4±0.8	29.5±1.1 ***	26.9±0.6	30.2±0.3 ***	1.90±0.06	1.62±0.10 **	285.0±14.7	304.0±3.2
<i>Solanum tuberosum</i>	24.1±1.5	30.3±1.8 *	25.3±1.8	29.8±1.3 *	29.7±1.0	31.3±1.1 *	1.75±0.06	1.45±0.05 **	280.2±8.3	304.5±2.1 +
<i>Spinacia oleracea</i>	18.2±2.2	26.9±1.3 ***	18.8±1.7	27.5±1.4 ***	29±1.6	31.8±2.1 **	2.20±0.08	1.40±0.09 ***	308.8±12.2	316.0±23.0
<i>Triticum aestivum</i> (spring)	22.2±1.3	29.5±1.0 **	21.2±1.0	28.1±2.7 *	25.8±1.0	30.3±1.5 +	1.89±0.05	1.56±0.09 **	313.3±4.2	311.5±2.4
<i>Triticum aestivum</i> (winter)	22.4±0.8	30.0±1.0 ***	21.4±0.9	28.8±1.5 **	24.3±0.8	33.0±0.6 *	1.90±0.09	1.52±0.12 **	247.8±17.0	312.2±9.0 **
<i>×Triticosecale</i> Wittmack	23.8±0.8	28.5±1.5 **	22.9±2.3	27.5±1.3 *	26.0±0.5	29.1±0.8 ***	2.02±0.09	1.64±0.11 **	297.8±13.1	311.1±4.3
<i>Vicia faba</i>	24.3±1.5	24.9±0.8	25.1±1.2	25.5±0.8	26.3±1.7	30.5±1.2	1.82±0.07	1.86±0.08	237.3±8.1	262.3±14.7 *

Legends for supplemental Table and figures

Supplemental Figure S1

Temperature dependences of the dark respiratory rate (R_d), the photosynthetic rate at 360 $\mu\text{L L}^{-1}$ CO₂ concentration (A_{360}) and the intercellular CO₂ concentration (C_i). Data represent means \pm SD, n = 3~5.

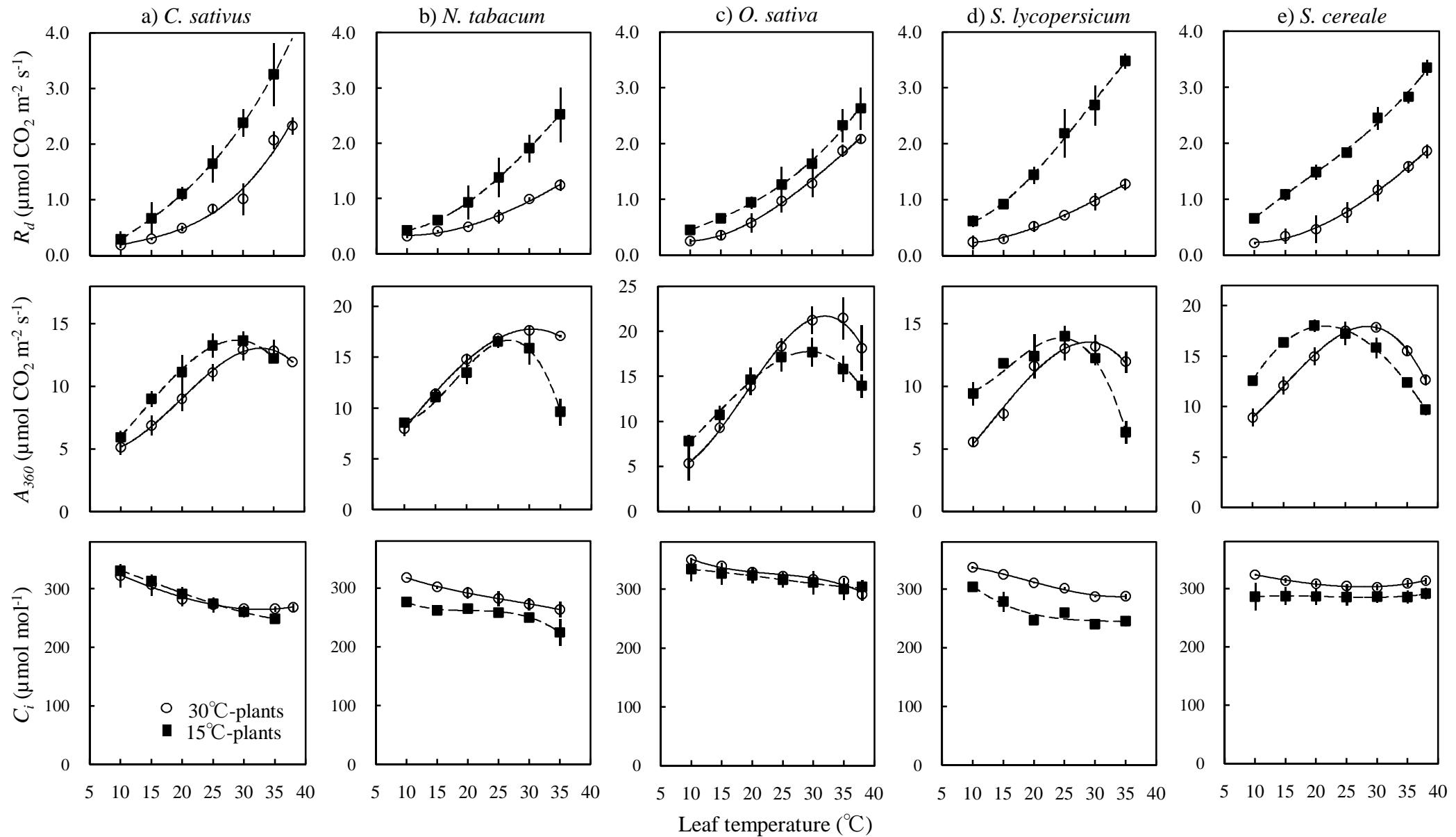
Supplemental Figure S2

Limiting step of the photosynthetic rate at 360 $\mu\text{L L}^{-1}$ CO₂ (A_{360}). The upper and middle rows of figures show the CO₂ dependence of the photosynthetic rate. Closed circles with bars denote the mean measured photosynthetic rates with standard deviations. Lines denote the ratio of the photosynthetic rate assuming the limitation by RuBP carboxylation (A_c) (dotted lines, see Eqn 2) or the limitation by RuBP regeneration (A_r) (continuous lines, see Eqn 3). The limiting step of A_{360} was also analyzed, using the model of Farquhar *et al.* (1980) with obtained parameter values in bottom row of figures.

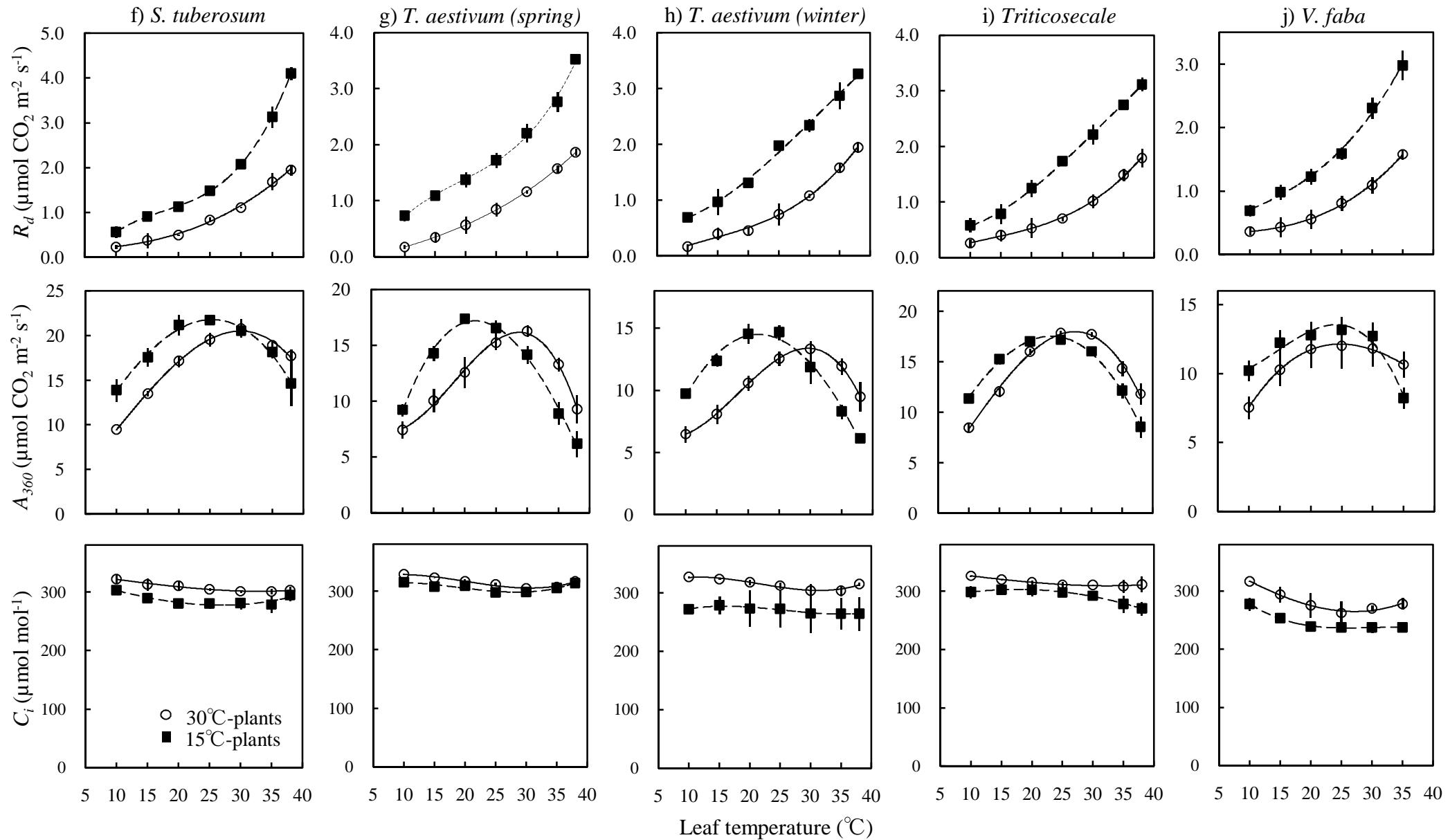
Supplemental Figure S3

Effects of Rubisco kinetics and mesophyll conductance on the limiting step of the photosynthesis at 360 $\mu\text{L L}^{-1}$ CO₂ (A_{360}). Sensitivity analyses of the limiting step of A_{360} were performed in *O. sativa* grown at 30°C (a, b) or 15°C (c, d) and in *S. cereale* grown at 30°C (e, f) or 15°C (g, h). Closed circles with bars denote the mean measured photosynthetic rates with standard deviations. The rates of RuBP carboxylation (A_c , dotted lines, see Eqn 2) and RuBP regeneration (A_r , continuous lines, see Eqn 3) were calculated for four conditions; 1) temperature dependences of Rubisco kinetic parameters obtained from Bernacchi *et al.* (2001) (A_c -1 and A_r -1), 2), temperature dependences of Rubisco kinetic parameters multiplied by 1.15 from the value of Bernacchi *et al.* (2001) (A_c -2 and A_r -2), 3), Rubisco kinetic parameters multiplied by 0.85 from the value of Bernacchi *et al.* (2001) (A_c -3 and A_r -3), and 4) We took account of mesophyll conductance (g_m) with an assumption the relationship between g_m and the photosynthetic rate (A) at 25°C ($g_m = 0.012 \times A$, Evans & von Caemmerer, 1996) and used temperature dependences of g_m and Rubisco kinetic parameters from Bernacchi *et al.* (2002) (A_c -4 and A_r -4). The V_{cmax} , J_{max} and R_d were estimated from the CO₂ response of A . Values are the mean; n=3~5.

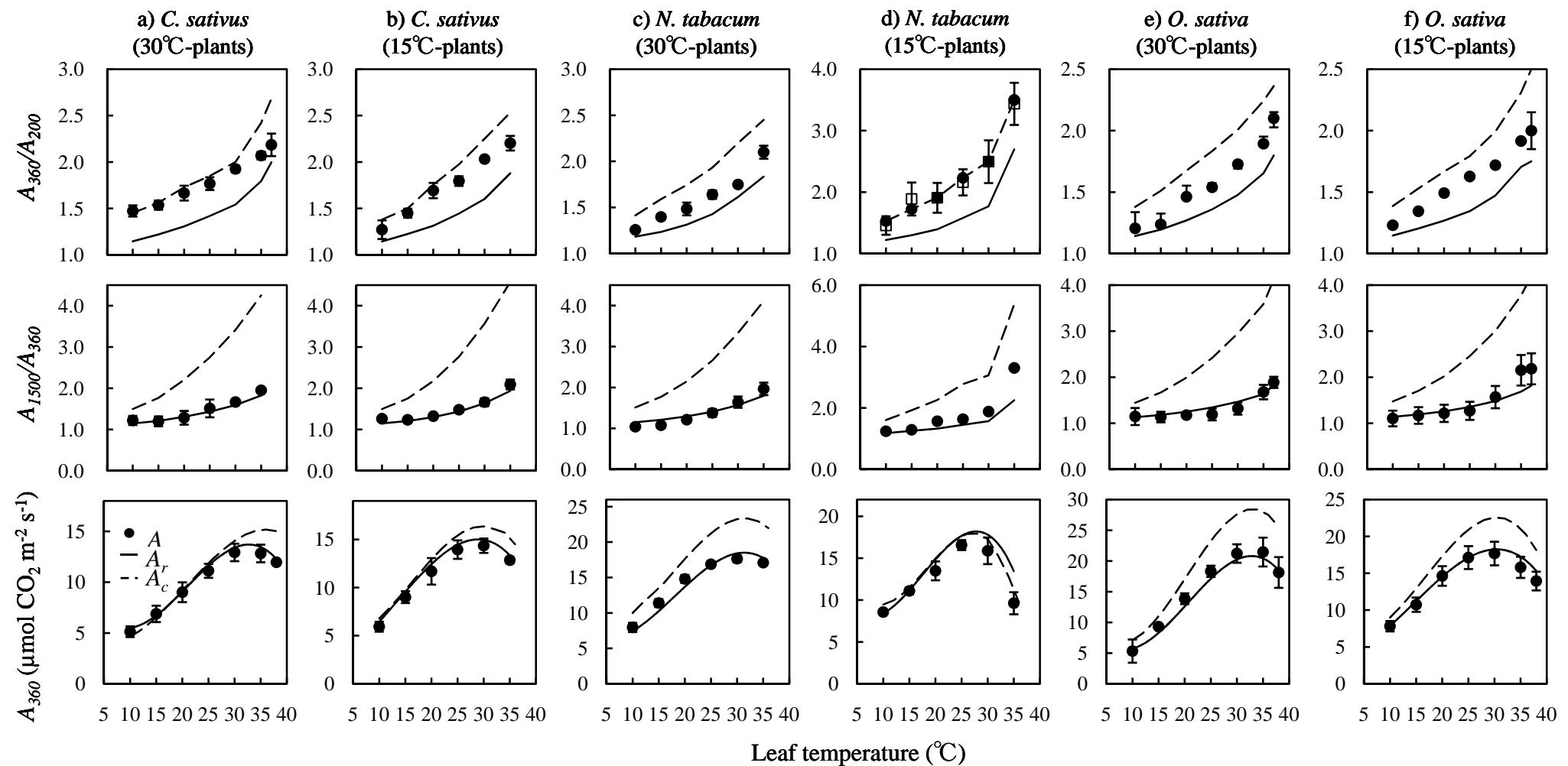
Supplemental Figure S1



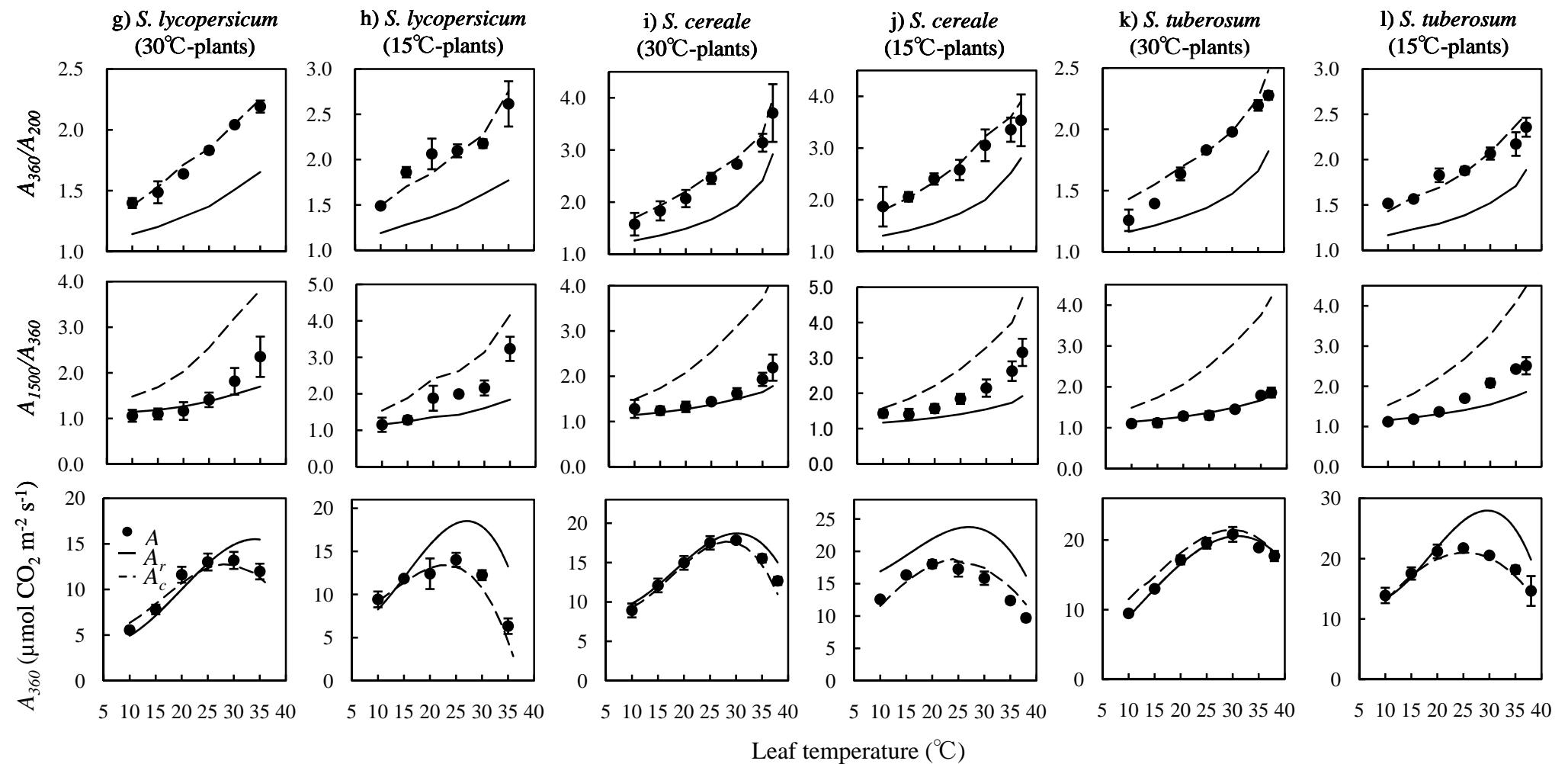
Supplemental Figure S1



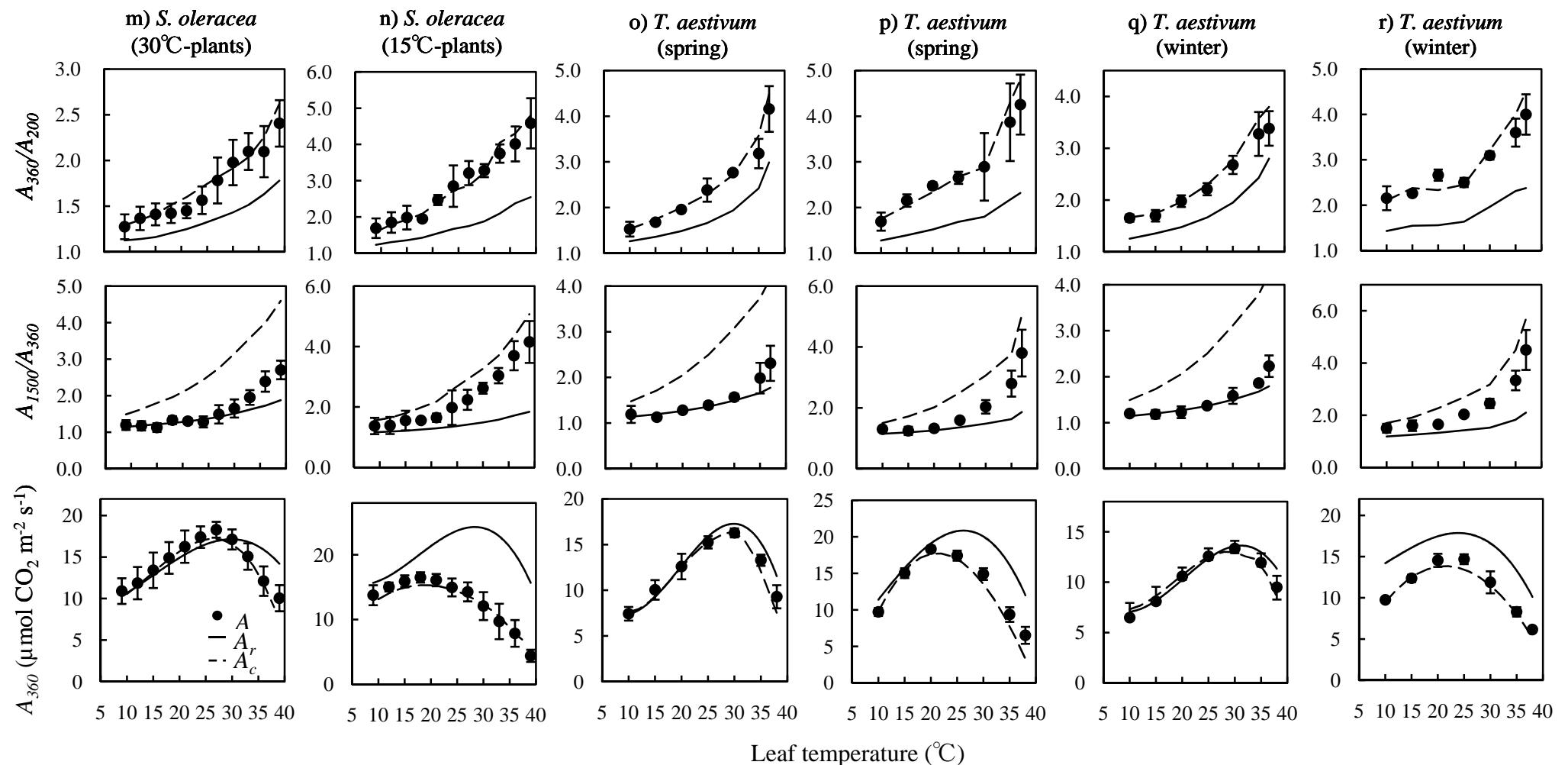
Supplemental Figure S2



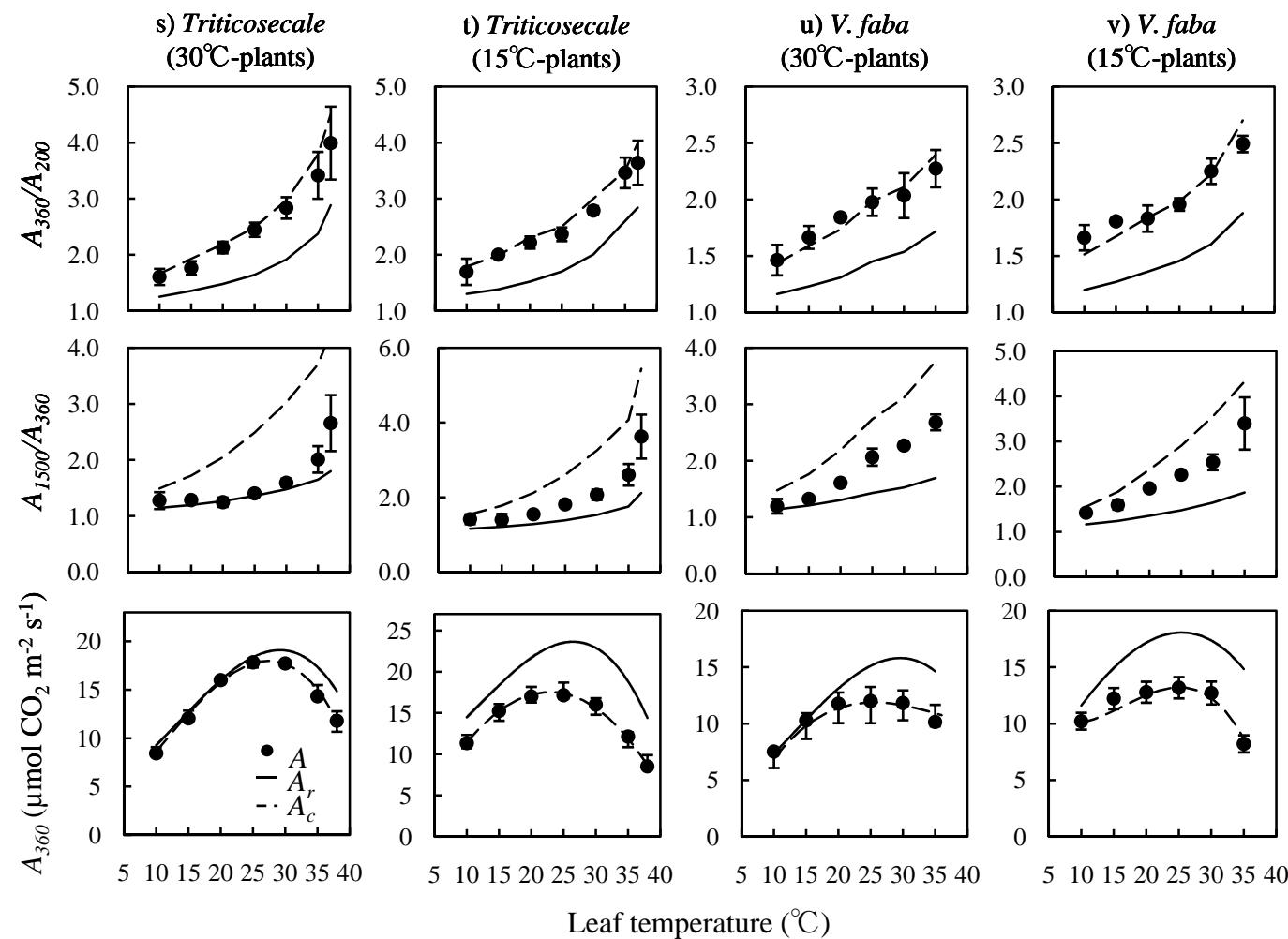
Supplemental Figure S2



Supplemental Figure S2



Supplemental Figure S2



Supplemental Figure S3

